

Introduction to the Markets, Policy, and Computation Minitrack, Electric Energy Track

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Environmental concerns regarding global warming and the adverse health effects of emissions produced by fossil fuel generation have led to a greater reliance on renewable sources of generation that are inherently variable and uncertain. This trend is accompanied by increased proliferation of distributed resources, storage and smart grid technologies that facilitate demand response and greater observability of the grid. As a result the electric power industry faces new challenges in planning and operation of the power system that require new market mechanisms and computational optimization tools to achieve productive and allocative efficiencies. Flexibility of the conventional generation resource portfolio as well as demand side flexibility are key elements of a new electricity system paradigm that can accommodate massive integration of renewables and distributed resources. Harnessing such flexibility in planning and operations imposes vast computational challenges due to the increased numbers of decision variables and the need to account for uncertainty and respond adaptively to rapidly changing conditions. Hence the central theme of this mini track revolves around identifying requirement and remuneration schemes for flexibility, characterizing market products and public policies that incentivizes flexibility and optimizing resource use to meet flexibility needs so as to assure system reliability in face of uncertainty at least cost.

This minitrack continues a long-standing tradition that evolved over the last two decades since the onset of restructuring the electric power industry in the US. Over that period HICSS has become a leading forum for discussion and outlet for research and new developments that focused on the interplay between market design for the restructuring

electricity industry and computational tools enabling the efficient and reliable operation of a market based power system. The minitrack consists of two sessions. The first session focuses on Market Design and Analysis. The first paper addresses the impact of mobilizing end user flexibility on the vertical separation between the wholesale market and local monopolies. The second paper discusses a case study of Massachusetts clean energy initiative. The third paper focuses on the question of whether natural gas to supply power plants should be shipped on demand or stored at the plant location. The forth paper examines the environmental impacts of using energy storage aggregations to provide multiple services. This session facilitates comprehensive discussion of market constructs and policies and their implications in electric energy systems.

The second session focuses primarily on New Frontiers in optimization and control in the context of Power Systems. The first paper describes look-ahead scheduling policies of energy storage in regulation market. The second paper evaluates the benefits of “rolling horizon model predictive control” for intraday scheduling of a natural gas pipeline market. The third paper is a theoretical analysis of monotonicity between phase angles and power flows, which can have profound implications on algorithmic performance and the uniqueness of solutions to OPF problems. The fourth paper employs a stochastic two-stage unit commitment framework to demonstrate the potential economic benefits of including strategic wind power modulation in day ahead dispatch compared to the prevailing must take policy with feed in tariffs.